REMARKS

Claims 13-27, 34-47, and 50-52 will be pending upon entry of the present amendment.

Applicants thank the Examiner for indicating the allowability of claims 13-27 and 34-46.

The Examiner has rejected claims 47 and 50-52 under 35 U.S.C. § 103(a) as being unpatentable over Shaw et al. (U.S. Patent No. 5,847,454, hereafter *Shaw*) in view of Dhuler et al (U.S. Patent No. 6,410,361, hereafter *Dhuler*). Applicants respectfully traverse this rejection.

Claim 47 recites, in part, "a circuit configured to detect electrical contact between the second portion of the beam and the first conducting layer." Neither Shaw nor Dhuler teach or suggest this limitation, so a combination of these references cannot teach or suggest such.

The Examiner acknowledges that Shaw fails to provide an electrical circuit as recited (see item 3, second paragraph, of the recent Office Action), but states that Dhuler discloses such a circuit. In particular, the Examiner states that "Dhuler et al disclose methods for fabricating in-plane MEMS thermal actuators wherein Fig. 5E the required detection configuration is disclosed." However, neither Dhuler's Figure 5E, nor any other figure, provides such a disclosure. Instead, Dhuler's Figures 5A-5G illustrate steps in a manufacturing process. With regard to Figure 5E, Dhuler states:

> Referring to FIG. 5E, shown is the thermal actuator construct after exposed silicon surfaces have been subjected to a conventional diffusion doping process. The doping process provides for a continuous conductive path along the periphery of the composite beam and defines the contacts on the anchor.

Dhuler, column 9, line 66 to column 10, line 4.

The contacts referred to in the quoted passage serve as connection points, located at the end of the beam that is anchored to the substrate, for an energy source that provides a current in the conductive path to heat the beam, causing it to deflect (see column 5, lines 15-22). There is no teaching or suggestion of a circuit configured to detect electrical contact, as recited in claim 47, nor is there any structure provided with which the beam could make contact. Furthermore, not only would such an arrangement be unnecessary to Dhuler's device, it would interfere with the device's normal operation.

The current path along the periphery of the beam is provided as a heating element to provide efficient thermal actuation (see column 5, lines 55 et seq.). There is no requirement for detecting contact between the beam and some other structure since the position of the beam is known, and thus need not be detected. Dhuler is directed to "a thermal actuator having self-contained heating capabilities and providing in-plane actuation." (*Dhuler*, column 1, lines 12-15.) As is known in the art, an actuator of the type disclosed in Dhuler is commonly used to apply force for a selected purpose, such as for adjustment of optical devices, operation of micro valves or pumps, etc. The physical characteristics of the material of the device are selected such that a given current will produce a commensurate deflection (see column 6, lines 6-18).

Even if a combination of Dhuler with Shaw could teach all the limitations of claim 47 (which the applicants dispute), there is no motivation to combine the references since they employ different principles of operation. Shaw is directed to a device that operates via capacitive coupling, which relies on emplacing a static electric charge on conductors separated by a dielectric, while Dhuler is thermally operated, which requires an electrical current to flow in the conductive paths. Neither reference offers any means of reconciling these disparate operating methods. Dhuler raises and dismisses capacitive (i.e., electrostatic) actuators in its background (see column 1, lines 30-50), and so discourages such a combination. The Examiner has suggested that a combination would be motivated by an "increased sensitivity with low power applications," but has not explained how the combination would operate, nor how an improved sensitivity or reduction in power would be achieved.

Finally, both references individually teach away from a device in which electrical contact with another structure is contemplated. As indicated, Shaw is directed to a device that employs capacitive coupling for its operation (see *Shaw*, column 14, lines 6-22). Such a structure relies on the capacitor formed by the "close proximity" of two conductive plates. As the distance between the plates changes, so too does the capacitance. Accordingly, a circuit configured to measure the variation in capacitance can be used to detect movement of a beam, and also the degree of movement. However, a capacitor requires a dielectric between its conductive plates (an air-gap dielectric, in the case of Shaw). If Shaw's capacitively coupled beam were to actually touch the side wall, the capacitor would short out, which, at the very least,

would cause the associated circuit to malfunction; at the worst, it would destroy the circuit. Clearly, by teaching a capacitive device, Shaw teaches away from the invention of claim 47.

For its part, if Dhuler's beam were to make contact with some other conductive structure, some or all of the current passing therethrough would be drawn off, which would interfere with the heating operation. Dhuler provides various means to avoid such an occurrence. For example, in one embodiment, Dhuler provides a trench underneath the beam to prevent such contact, stating that, "[w]ithout a trench in place, there is a likelihood that depositing the metallic second layer will lead to electrical shorting of the underlying microelectronic substrate and any metal elements defined on the substrate" (column 5, lines 43-46). Clearly, Dhuler also teaches away from the invention of claim 47.

For at least these reasons, a combination of Shaw and Dhuler cannot support a prima facie case of obviousness against claim 47, which is therefore allowable.

Claim 50 recites, in part, "means for detecting contact between the second portion of the beam and a wall of the trench." A combination of Shaw and Dhuler fails to teach or suggest this limitation of claim 50. The Examiner has acknowledged that Shaw does not provide such a teaching, and Dhuler cannot remedy the deficiency. Dhuler does not offer a teaching or suggestion of any means for detecting a contact between a portion of a beam and a wall of a trench. Dhuler's device is not formed in a trench, but on a surface of a substrate (see Figures 1A, 2, and 5A-5G). There is no equivalent structure provided with which the beam might make contact, and the device would not detect the contact if there were. Dhuler is instead directed to a thermally driven actuator that is heated by an electric current that passes through a conductive path in the beam.

Clearly, neither Shaw nor Dhuler teaches or suggests the recited limitation of claim 50. Accordingly, claim 50 is allowable over the art of record, together with dependent claims 51 and 52.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

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